

Math Challenge #9

First Name: _____	Last Name: _____	Grade: _____
Teacher: _____	Parent's email: _____	

Exploring Patterns

Kinder & First Grade: solve at least 3 problems.
Second & Third Grade: solve at least 7 problems.
Fourth Grade and above: solve at least 12 problems.

	<i>Answer</i>												
1.	<i>Red circle</i> Or												
2. <table border="1" style="display: inline-table; margin-right: 20px;"> <tr><td>Figure</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr> <tr><td>pieces</td><td>2</td><td>4</td><td>6</td><td>8</td><td>10</td></tr> </table> Another way to do it: we start from 2 triangles and notice that the next figure will have 2 additional triangles. $2 + 2 \times 4 = 10$ pieces <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="text-align: center;"> Figure 1 2 pieces </div> <div style="text-align: center;"> Figure 2 4 pieces </div> <div style="text-align: center;"> Figure 3 6 pieces </div> <div style="text-align: center;"> Figure 5 10 pieces </div> </div>	Figure	1	2	3	4	5	pieces	2	4	6	8	10	10 [pieces]
Figure	1	2	3	4	5								
pieces	2	4	6	8	10								
3. If we repeat the pattern (until the 10 th shape), we will have: <div style="display: flex; justify-content: center; align-items: center; margin-top: 10px;"> </div>	A triangle												
4. If the number after division by 2 gives a remainder of 1, it means that the number is odd. His list would have all the odd numbers between 10 and 30. The highest odd number in the list would be 29.	29												
5. $4+6+8+10 = 28$	28 [students]												
6. Notice that for 2 pictures, 3 tacks are needed. For 3 pictures, 4 tacks are needed. For 4 pictures, 5 tacks are needed. So, for 18 pictures, 19 tacks are needed. <div style="text-align: right; margin-top: 10px;"> </div>	19 [tacks]												
7. If there are 3 people in the first row, there will be 5 people in the second row, 7 people in the third row, and so on. $3 + 5 + 7 + 9 + 11 = 35$ <div style="margin-left: 100px; margin-top: 10px;"> Last row </div>	11 [students]												
8. Two drawings use 6 tacks, 4 drawings 12 tacks, so, the pattern is +6 tacks for two drawings. 20 drawings will use 60 tacks. <div style="margin-top: 10px;"> </div> Another way to think about it: for 20 drawings displayed in two rows, there are 10 drawings per row. Every 2 drawings use 6 tacks, $6 \times 10 = 60$ tacks	60 [tacks]												

9. **Time Needed to Make Posters**

Number of Posters	Number of Minutes
1	5
2	7
3	10
4	14
5	19
6	25

The pattern: 5, 7, 10, 14, ... (adding 2, 3, 4, and so on).
 The number of minutes for making 5 posters is $14+5 = 19$.
 The number of minutes for making 6 posters is $19+6 = 25$.
 The number of minutes for making 7 posters is $25+7 = 32$.

32 [minutes]

10. In one week = $(1 \text{ hour} \times 5 \text{ days}) + (2 \text{ hours} \times 2 \text{ days}) = 9 \text{ hours}$
 In 6 weeks = $9 \text{ hours} \times 6 = 54 \text{ hours}$

54 [hours]

11. $1+2+4+8+16+32 = 63$ peppers

63 [pepper plants]

12. $(75 \text{ min} \times 5 \text{ days}) + (90 \text{ min} \times 2 \text{ days}) = 375 + 180 = 555 \text{ minutes}$.
 We convert 555 minutes to hour = $555 \div 60 = 9.25 \text{ hours}$ or $9 \frac{1}{4} \text{ hours}$

9.25 [hours] or $9 \frac{1}{4}$ [hours]

13.

a.

Notice that the pattern repeats every 3 numbers. The 3rd, 6th, 9th, 12th, 15th, 18th, 21st, 24th shape is a triangle. Therefore, the number 25th shape is a pentagon, and the number 26th shape is a square.

b.

Notice that the pattern repeats every 4 numbers. The 4th, 8th, 12th, 16th, 20th, 24th, 28th, 32nd shape is a hexagon. Therefore, the number 33 shape is a circle.

a. Square
 b. Circle

14.

Notice that the pattern is 1×1 , 2×2 , 3×3 , 4×4 , and so on.
 Figure 13 will have $13 \times 13 = 169$ dots

169 [dots]

15.

Height	4	5	6	7
Width	4	5	6	7
Perimeter	16	20	24	28

Notice that the Perimeter is $4 \times \text{height}$ or width. Therefore, the perimeter of the same shape with height 25 units and width 25 units is 100 units.

Another way:
 Perimeter of each shape is the same as the perimeter of a square (because opposite sides of the square are equal by measurement).
 So, we need to find the perimeter of the square with the side of 25. It is $25 \times 4 = 100$ units.

100 [units]

16. Notice the following: we start with 4 and add on 3 each time.
 4, 7, 10, 13, ...
 The number of lines for six squares = $4 + 5 \times 3 = 19$.
 The number of lines for 100 squares long = $4 + 99 \times 3 = 301$

301 [line segments]

17.



Figure 1

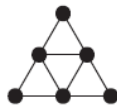


Figure 2

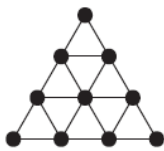


Figure 3

Notice that the pattern is 1 triangles, 4 triangles, 9 triangles, and so on. Each subsequent figure we add the next consecutive odd number.

$$1, \underbrace{4}_{+3}, \underbrace{9}_{+5}, \underbrace{16}_{+7}, \dots$$

Figure 10 will have: $1+3+5+7+9+11+13+15+17+19 = 100$ triangles with perimeter 3 units.

Another way is to notice that the number of triangles are square numbers: $1^2, 2^2, 3^2, 4^2, \dots$
 Figure 10 will have 10^2 or **100 triangles**.

100 [triangles]

18

A	B	C	D	E	F	G
1		2		3		4
	7		6		5	
8		9		10		11
	14		13		12	
15	

Each row has either 4 numbers or 3 numbers, so the pattern is made of 2 rows with 7 numbers.

$100 \div 7 = 14 \text{ r}2$ it means, we'll have 14 times repeating the same pattern (counting up by 1: 1, 2, 3, 4, 5, 6, 7, ...).

$14 \times 7 = 98$. 98 will be in column B, 99 will be in column A so 100 will be in column C.

Another way to think about it: the pattern repeats every 7 numbers, and notice that multiples of 7 are in Column B. 98 (closest multiple of 7 to a 100) will be in Column B, 99 will be in Column A, and 100 will be in **Column C**.

[Column] C

Solution is available on February 18, 2022, at www.mathinaction.org